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A Theory of Planned Behavior-Based Fruit and Vegetable Intervention for College Students

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Submitted in Partial Completion of the Requirements for
Commonwealth Honors in Movement Arts, Health Promotion & Leisure Studies

Bridgewater State University

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ABSTRACT

Objective: To evaluate the effectiveness of implementing a brief Theory of Planned Behavior-based nutrition intervention to address fruit and vegetable consumption in college students.

Design: Two in-person lessons utilizing activities based around TPB were implemented to a class of college students. A Theory of Planned Behavior (TPB)-based pretest and posttest assessed constructs regarding fruit and vegetable consumption. Fruit and vegetable intake was measured by a pre-and-post 3-day dietary record. Results gathered from all parts of this intervention were analyzed with paired t-tests in SPSS.

Setting: Bridgewater State University; Health Promotion Strategies Class

Participants: 16 Bridgewater State University Students, ages 21 and older, and mostly female

Results: Survey results about TPB constructs and fruit and vegetable consumption did not significantly increase between pre-and-posttests. Yet a high intention to consume the daily recommend amount existed.

Conclusion: Though students showed high intention to consume fruits and vegetables through their responses to the pre-and-posttests, students did not consume the daily recommended amount of fruits and vegetables. This showed that the intervention did not have an impact on behavior change but slightly increased intention to consume fruits and vegetables. The study supported the idea that college students do not consume the daily recommended amount of fruits and vegetables.

Key Words: Theory of Planned Behavior (TPB), college students, fruit, vegetable, nutrition intervention

INTRODUCTION

Obesity as it Relates to College Students, Diets, and Nutritional Standards

Obesity is defined as having a Body Mass Index (BMI) of over 30.0 (U.S. Department of Health and Human Services, 2016). Such a BMI indicates a weight significantly higher than the normal range of (18.5-24.9). The American College Health Association (2017) found that 14.6% of North American college students fall into class I-III obesity (BMI 30.0-40.) and 23.2% are overweight (BMI 25-29.9). Poor nutritional habits can increase the risk of obesity, a health condition that can potentially lead to other more serious illnesses. According to the NCD Alliance (2017), “Unhealthy diets (especially those which have a high content in fats, free sugars and salt) and physical inactivity are among some of the leading causes of noncommunicable diseases (NCDs) including cardiovascular diseases (CVD), type 2 diabetes and certain cancers. 2.7 million deaths are attributable to diets low in fruits and vegetables.” To prevent the problem from getting worse, action should be taken.

A proper diet, along with physical activity, can reduce a person’s risk of becoming obese, thus also reducing the chances of a person developing illnesses linked to obesity. A diet specifically lacking in fruit and vegetable consumption can increase the risk of obesity. Education can influence a person’s consumption of fruits and vegetables, as people may not have been taught dietary standards. The American standard of fruit and vegetable consumption varies per person (due to age, height, weight, caloric needs, etc.) but about 2-2.5 cups each for fruits and vegetables is the general amount of consumption for a person on a 2,000-calorie per day diet (USDA, 2015). People may not know what that looks like for an average meal or may not know

what qualifies as servings of fruits or vegetables. This inhibits proper consumption. Educational intervention could and has been used to increase fruit and vegetable consumption.

Adolescence and Young Adulthood

Adolescence and young adulthood are transitional periods spanning ages 10-25 years old, and it is a time where biological, social, environmental developments occur (Healthy People 2020, 2018). Behavioral patterns and habits that occur during this period can be carried through life and help determine future health risk/status (Healthy people 2020, 2018). Dietary intervention during these developmental periods can assist students with improving diet, managing weight, and reducing the risk of certain life-threatening non-communicable diseases. According to Healthy People 2020 (2018), "...Interventions to improve weight can support changes in diet or physical activity. They can help change individuals' knowledge and skills, reduce exposure to foods low in nutritional value and high in calories...." Starting interventions in these time periods can help young people learn healthy habits in order to better their future outcomes.

College Student Fruit and Vegetable Intake

College can be a time when young adults' neglect proper nutrition. Stress, lack of knowledge, and food availability/convenience are some possible factors playing into poor diet (Blake, 2017). The American College Health Association (2017) found that 62.3% of college students nationally only consume 1-2 cups of fruits and vegetables a day. In Massachusetts, 35.1-45.1% of people ages 18 to 24 consume less than one serving of fruit per day, and 19.6-26.4% consume fewer than one serving of vegetables per day (Centers for Disease Control, 2015). Lastly, according to a 2017 survey, Bridgewater State University students consume 3.3 cups of

fruits and vegetables on average, which is better than national and state statistics, but is less than the total 2 cups of fruit and 2.5 cups of vegetables recommended for a person with a 2,000-calorie diet (FRUVED, 2018). At the national, state, and local level, the data support that college-aged students are not meeting daily recommendations.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) examines the relationship between a person's attitudes, beliefs, intentions, perceived control over behavior, and behavior (U.S. Department of Health and Human Resources, 2005). Behavioral intention can be seen as one of the most important determining factors for behavior change (U.S. Department of Health and Human Resources, 2005). The construct of perceived behavioral control is the belief a person has an amount of control over what they can do in order to perform a behavior. Subjective norm is a construct that looks at a person's beliefs and whether key people approve or disapprove of their behavior. Attitude is a person's own evaluation of the behavior, and intention is the likelihood of carrying out the behavior (U.S. Department of Health and Human Resources, 2005). This type of theory can help intervention participants gain knowledge while also working on their intention to change a behavior. This shows that TPB can be a useful backbone for an intervention for increasing fruit and vegetable consumption and knowledge.

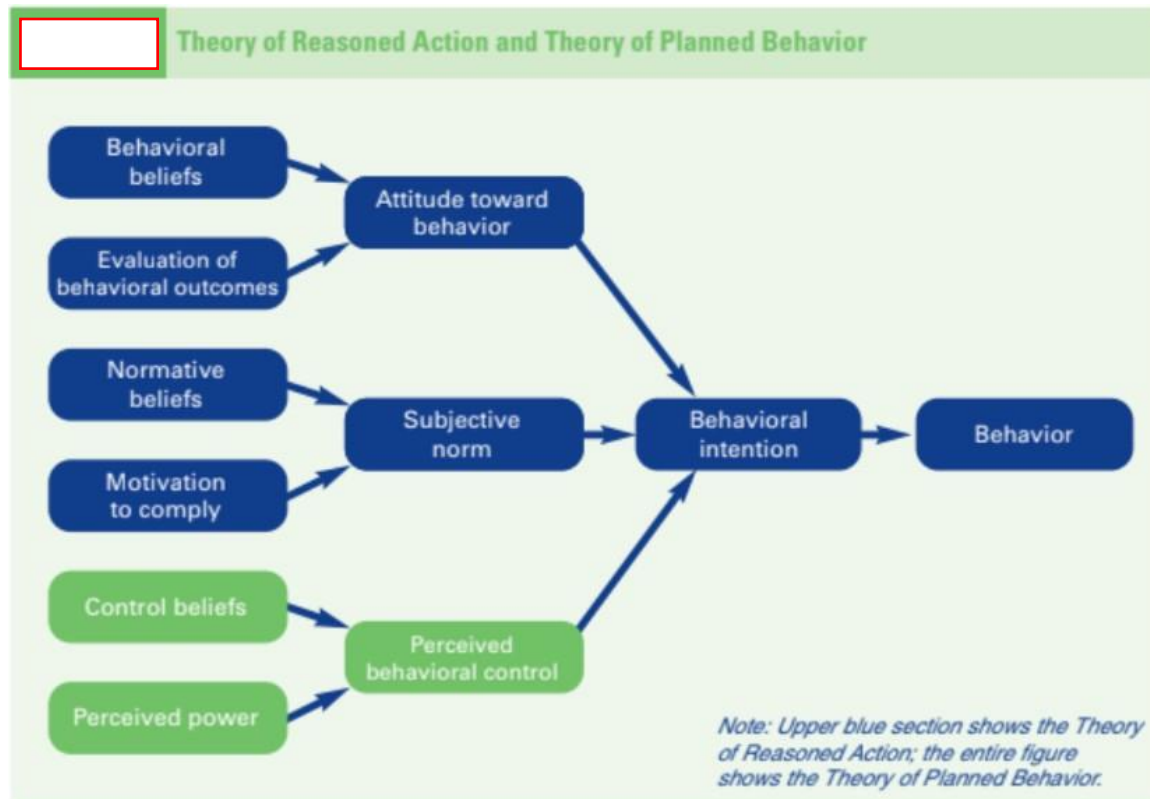


Figure 1: TPB model from Theory at a Glance

Review of Theoretical Literature

Theory of Planned Behavior Interventions and Evaluations

Blanchard et al (2009) used the theory of planned behavior to evaluate the adherence to a 5-vegetable per day regiment for college students. They hypothesized that affective attitude would be the main indicator of recidivism. Researchers surveyed 511 students from two universities. The students were a mean age of 19.8 years, had a mean body mass index (BMI) of 24.0, and were at a near 50/50 female to male ratio. Also, students were mainly black (47.2%) or white (39.1%). The researchers used attitude, subjective norm, intention, and perceived behavioral control toward fruit and vegetable consumption as measurements in their theory of planned behavior-based survey. A week after students completed the initial survey they completed a “1-page questionnaire that contained 6 questions from the behavioral risk factor surveillance system (BRFSS)²² to measure the past week’s fruit and vegetable consumption.”

Researchers found that a person's affective attitude toward and perceived control over 5-day fruit and vegetable consumption were significant predictors of whether or not a person actually consumed the designated amount. This deviated from past studies that found subjective norm and intention drove behavior. However, this research shows that affective attitude can have an impact as well (Blanchard et al, 2009).

Kothe and Mullan (2014) tested whether or not a TPB intervention promoted fruit and vegetable consumption in college students. The researchers hypothesized that the theory would improve consumption but not necessarily lead to a lasting behavior change. They also looked into the extent the theory of planned increased/effectuated fruit and vegetable consumption and potential behavior change. The researchers implemented the Fresh Facts 2011 30-day (an email-driven lesson plan using TPB constructs) intervention program and issued a TPB questionnaire to a group of 194 first-year Australian college students (average age 18.9 years). They found that before baseline testing participants consumed 4.4 servings of fruit and vegetables per day. A day after the intervention, the participants recorded an average of 5.2 servings. Researchers noted that all areas of TBP increased in influence over the course of the intervention. When looking at association between the constructs, researchers believe that the increased social pressure (or subjective norm) was an important factor in the increase of intention. After looking at those relations, researchers found intention was a significant indicator of fruit and vegetable consumption. The researcher's finding in this study supports the idea that TPB can increase fruit and vegetable consumption, but it may not indicate total adoption of behavior change overall.

Kothe and Mullan's (2015) study looks into the interaction of TPB constructs as they related to predicting fruit and vegetable consumption. They hypothesize that interaction between constructs will increase consumption. The Australian university participants were split into three

cohorts, one being a predictive (control) cohort and the other two being intervention groups. TPB was assessed in a questionnaire where each construct was measured via a mean of specific answers. Researchers found attitude moderated the impact of perceived behavioral control on intention while perceived behavioral control moderated the impact of intention on behavior at one week post intervention only. This study supports and demonstrates the idea that the interaction/interdependence of constructs need to be considered when conducting an intervention using TPB.

Menozzi, Sogari, and Mora (2015) hypothesized that several background factors like age, gender, living situation in connection with the TPB constructs will impact behavior, thus impacting (and possibly increasing) fruit and vegetable consumption. Multiple hypotheses were looked at, but the initial hypothesis is the main one discussed. A cross-sectional sample of 823 college students from the University of Parma in Northern Italy completed a questionnaire taking into account TACT (Target, Action, Context, Time) to define behavior and Ajzen's TPB methodology. Researchers found that the mean vegetable consumption was about three servings per day, that behavior is significantly affected by intentions, and that other background factors stated prior also impact all of the constructs like gender influencing attitude. In the end, the study helped to support the idea that TPB can work towards predicting intention to consume at least two servings of vegetables. Also, researchers surmised that interventions focusing on subjective norm, attitude, and perceived behavioral control may help with intention.

Model Intervention

In Ha and Caine-Bish's (2009) study, a short intervention and evaluation using the Social Cognitive theory was implemented and assessed. They hypothesized that general nutrition class

would increase fruit and vegetable consumption to at least the nutritional standard of 4.5 cups per day. A total of 80 students' ages ranging from 18 to 24 years old that were enrolled in a sophomore level nutrition class at a mid-western university participated. These students were conveniently, rather than randomly selected, which is a limitation. After having a dietary assessment via questionnaire and interview, the students participated in a class that met 3 times a week for 50 minutes over 15 weeks. The classes covered various topics, including nutrition and disease prevention; discouraging overreliance on supplements; promoting active lifestyles; increasing fruit, vegetable, and wholegrain consumption; and promoting an active lifestyle. Lessons were hands-on/interactive, goal oriented, and reinforced student's environmental and social lives. Informational videos also supplemented the information taught. Researchers found after conducting a posttest that students averaged 2.85 cups per day, which was more than the 1 or fewer cups they started out with. Although this increase is not much, it suggests that interventions using theory constructs can motivate students to increase fruit and vegetable consumption.

Aims of Current Study

This study aimed to assess the current intake of fruit and vegetables in a sample of college students and evaluate the effectiveness of a TPB intervention using the constructs of the TPB (i.e., attitude, social norm, and perceived behavioral control). This study also aimed to increase knowledge of the general fruit and vegetable standard as well as increase fruit and vegetable consumption.

METHODS

During spring semester 2019, 20 Bridgewater State University (BSU) students ages 21 and older enrolled in Dr. Angela Bailey's Health Promotion Strategies (HEAL451) course. They were selected to participate in the program. Students had the option to not participate and opted out before the first lesson began. Of the 20 students, 4 opted out and 16 participated in the program. Exclusions included students who had severe dietary restrictions. Of the 16 who participated, eight completed all parts of the program. In order to conservatively assess the data and reduce as much bias as possible, all 16 students were considered in the analysis of data in an intention-to-treat manner. This type of analysis assumed that those who did not complete the data would have no data change/behavior change over time, therefore their initial data was carried throughout each part of the intervention. If noncompliant students' data were completely excluded, the already small sample size would be reduced and lessen the statistical power of the investigation (Gupta, 2011).

No students stated that they had a severe dietary restriction. The students consisted of undergraduate students in the health studies/public health major and also had various minors. Two of the eight students who completed all portions of the intervention were nutrition minors, one student was a psychology minor, one student was a health resources management minor, one was a Portuguese minor, and three students had no minor listed. Students were told that the purpose of this program was to obtain data for a theory and nutrition-based Honors Thesis project. The BSU Institutional Review Board approved the research conducted and each student was given the option to participate via agreeing to an informed consent statement prior to taking the pretest.

A pretest and posttest method was used to assess the effectiveness of the TPB-based fruit and vegetable lessons. The pretest was implemented February 21, 2019 and the posttest was implemented March 28, 2019. Both the pretest and posttest included questions that were worded according to Icek Ajzen's (2006) guidelines for constructing a survey based on TPB constructs. Questions specifically addressed the constructs of intention, attitude, perceived behavioral control, and subjective/social norms. Questions were rated on a six-point Likert scale, with one to three being "strongly disagree," "disagree," and "somewhat disagree" and with the questions four to six being "somewhat agree," "agree," and "strongly agree." Two questions also addressed past behaviors and knowledge of fruit and vegetable consumption standards. The pretest was the same as the posttest except for the last three questions of the posttest, which were questions involving students' assessment of the intervention activities.

In order to analyze the questions based on constructs, the pre-and-posttest questions were grouped into constructs in order to get a mean for each. Four questions looked at attitude, three questions involved perceived behavioral control, two questions looked at subjective norm, and two questions involved intention. All the attitude questions were added together and divided by four to get an overall mean. All other constructs were dealt with in a similar manner based on the number of questions they had in order to get a mean.

Additionally, two three-day dietary records issued in the beginning and end of the program were given to students. Students were instructed to record three days-worth of meals—two days being weekdays and one day being a weekend day. Students were also instructed to be as accurate as possible with measuring their food intake, using measuring cups, counting individual food items, looking at fluid ounces for beverages, etc. Six students completed the first record and three completed the second record. The intention-to-treat method was also applied to

the records—carrying over the missing data. One student only completed the post record, and this person’s data was eliminated completely.

Table 1. Lesson Activities		
Activity	Description	Theory of Planned Behavior Constructs
1. Fruit and Vegetable Kahoot!	Students answer questions about fruit and vegetables, health outcomes, their attitudes towards consumption of fruits and vegetables, their power over healthy eating, and their past behaviors.	Attitude and Perceived Behavioral Control
2. My-Plate/Fruit and Vegetable Standards	Students were told what the general fruit and vegetable consumption guidelines were, built their own meals with magnetic food and a MyPlate model (based off their own diets), and played a MyPlate game.	Perceived Behavioral Control, Intention
3. Check Yourself: Scenarios	Students received realistic scenarios in which they were to share at least two actions they would take if they were the person in the scenario to improve fruit and vegetable intake	Social Norm, Perceived Behavioral Control, Attitude, Intention
4. Family Feud	Students answered questions that reviewed information they learned in previous activities. Some questions were geared toward knowledge while others were geared toward student’s behaviors.	Perceived Behavioral Control
5. Assess and Plan	Students assessed their diets and made a list of things they would maintain or change to improve fruit and vegetable consumption.	Attitude, Perceived Behavioral Control, Intention

The lessons took place once a week for two weeks. Lesson topics addressed the quality of a balanced diet, the relationship of improper nutrition to increased risk for chronic diseases and poor health outcomes, the basic FDA/USDA fruit and vegetable consumption standards, some meal/diet building, and various ways to increase fruit and vegetable consumption. All of the activities were hands-on/interactive. Students participated in games and scenario assessments. A basic lecture was only a small part of the lesson time. Activities were geared towards knowledge retention and TPB constructs.

The first lesson consisted of students participating in a “Kahoot!” game that introduced the aforementioned topics and briefly assessed students’ perceived behavioral control, attitudes, social norms, and fruit and vegetable consumption. After discussing answers, the MyPlate model was introduced to the students as a guideline for them to use in order to help them balance their diets and increase their fruit and vegetable consumption. Two students volunteered to participate in creating fake meals based off of what they learned. Using magnets that represented food, the students showed their examples to everyone. After discussing the two students’ choices, members of the rest of the class mentioned what they would do to balance their own meals. In accordance with this activity, students also made their own meals in a MyPlate-style game.

Finally, students got into groups and read one of five poor diet/poor fruit and vegetable consumption scenarios. Members of each group listed out at least four things they would change or maintain if they were the person in the scenario.

For the second lesson, students played a fruit and vegetable themed game of Family Feud. The questions for the game involved a review of the fruit and vegetable consumption guidelines, poor diet outcomes, and ways to improve fruit and vegetable consumption. The next activity involved the students reflecting on their own diets. From there, they were told to write a

list of at least four actions they would like to do in order to improve or maintain their diet/fruit and vegetable consumption.

RESULTS

A total of 16 students enrolled in Health Program Strategies (HEAL451) Spring 2019. Of the 16 students, 15 of them identified as female and one as male. As for age, 12.5% of students are 21, 37.5% are 22, and 50% of students are 24 or older. As for year attending BSU, 12.5% were second year students, 6.3% were third year students, 75% of students were fourth year students, and 6.3% of students were fifth year or more. As for race, 62.5% of students were white/Caucasian, 12.5% were black/African American, 12.5% were Asian/Asian American, and 12.5% described themselves as another race not specified in the survey. Of all the students who participated in this intervention, two students completed all aspects of the intervention including the pre-and-posttest, pre-and-post three-day dietary record, and two lessons.

During the pretest, students' knowledge of USDA fruit and vegetable consumption standards were tested. Of the 16 students, 68% knew that 2-2.5 cups or more of fruits and vegetables per day was the standard. During the posttest, 81% of students showed that they knew the standard. An increase in knowledge of the standard occurred, which might be attributed to the intervention. The significance of this change is $P=.333$, which is not a significant change between the two tests (compared to $P=.05$).

Table 2. Self-Perception of Meeting Recommended Amount of Fruit/Vegetables Daily		
Question	Pretest	Posttest
In the past week, I have consumed the recommended amount of fruit and vegetables	37% self-reported meeting recommended intake	31% reported meeting recommended intake

daily		
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As for past behavior, students mostly answered that they did not consume the standard amount of fruits and vegetables both before and after the intervention. During the pretest, a total of 37% of the students reported meeting recommended fruit and vegetable intake in the past week (table 2). Only 31% of students reported meeting recommended intake during the posttest, indicating a 6% decrease. This data yields a value of $P=.580$, which also is not significant.

Pre-and-posttest standard deviations and means for the constructs are listed in Table 3.

Table 3. Pre-and-Posttest Variable Means + Standard Deviation for Theory of Planned Behavior Constructs and Fruit and Vegetable intake			
TPB Constructs N=16	Pretest	Posttest	P Value
Attitude	4.64 \pm .97	4.66 \pm .94	.860
Perceived Behavioral Control	4.71 \pm 1.02	4.77 \pm 1.07	.270
Social/Subjective Norm	3.47 \pm .53	3.75 \pm .89	.120
Intention	4.72 \pm .93	4.84 \pm .96	.164
Pre-and-Posttest Variable Means + Standard Deviation for 3 Day Dietary Record			
F/V Behavior N=6	Pretest	Posttest	P Value
3 Day Dietary Record of Fruit/Vegetable	2.10 \pm 1.16	2.07 \pm 1.20	.695

Consumption (cups)			
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For each of the TPB constructs, little to no deviation occurred for the pre-and-posttests. For attitude $P=.860$, for perceived behavioral control $P=.270$, for social norm $P=.120$, and for intention $P=.164$ —all of which are not statistically significant ($P<.05$). Also, there was no significant change in the dietary records ($P=.695$).

With this analysis, little to no changes in students' intention, attitude, and perceived behavioral control regarding fruit and vegetable consumption was detected in the pre-and-post surveys (Table 3). However, intention to consume fruits and vegetables remained high (4.72 to 4.84). The questions were rated on a six-point Likert scale, with any answer greater than 3 being in the favor of the constructs and the intention to increase fruit and vegetable intake to the standard amount of fruits and vegetables. On average, students indicated that they agreed (answering 4 or higher) with having an attitude that encourages fruit and vegetable intake. Most students also agreed that they have control over their intake.

As for actual consumption, the pre-and-post dietary records indicated that students consumed on average 2.10 fruits and vegetables before the intervention and 2.07 fruits and vegetables after. This yielded a P value of .695, which is not statistically significant. This average is under the minimum standard of 2-2.5 cups each of fruit and vegetables per day.

Overall students did not experience an increase in their fruit and vegetable consumption despite having a high intention to do so. Several variables may have led to these results being as they are.

DISCUSSION

The current study aimed to assess the intake of fruit and vegetables in a sample of college students and evaluate the effectiveness of a multi-part TPB intervention using the theory's constructs. Also, the study aimed to increase knowledge of fruit and vegetable consumption standards. Similar studies—like those of Menozzi, Sogari, and Mora (2015) and Kothe and Mullan (2014)—yielded results where college-age individuals did not consume the recommended amount of fruits and vegetables per day before and after interventions but did temporarily increase their intake somewhat and/or increase their intention to change their behavior.

This study demonstrated via dietary records that the baseline amounts of fruit and vegetable intake did not consistently meet the daily standard. Also, students' answers to a pre- and posttest question about meeting fruit and vegetable consumption in the past week indicated that students did not consume the standard over time. Overall, students' intake decreased after the intervention despite the slight increase in their intention to eat the standard. Throughout the testing period, students indicated that their intentions were to consume the standard amount of fruits and vegetables.

Such a discrepancy could be due to the fact that more than just knowledge and intention to change behavior can impact diet. Several factors can impact a person's food choices. According to Registered Dietitian Dr. Joan Salge Blake (2016), habits, trends, emotions, time, convenience, cost, culture, and many more factors influence a person's food choices. College students are no exceptions to this. Often college students lead busy lives and have multiple factors like time or convenience impacting what they eat. This could be an explanation as to why

the intervention did not change behavior and why students had high intention to change behavior but did not change.

The results also indicated that TPB's constructs did not impact behavior change, and intention to change did not increase significantly after the intervention was completed. From the start, most students answered positively to improving fruit and vegetable consumption—showing that they perceive consuming the standard as feasible. However, this did not dictate behavior. Students may have answered positively in favor of proper fruit and vegetable consumption because they had prior knowledge about proper nutritional habits. All the students were health majors (public health or health studies) and even some were nutrition minors. This would give them an advantage when answering the survey, and could be the reason why their scores for the constructs were so high to start. Such circumstances could also be why knowledge of the fruit and vegetable consumption standard did not increase over time. Improvement from an already high score may not be as likely to happen, and participants with little to no prior knowledge—like a class of business majors, for example—may have benefitted more from this intervention.

Some issues also existed with using TPB as a basis for fostering behavior change. Many nutritional studies that used TPB found that behavior change did and can occur with the theory as a backbone to intervention. However, participants/population types vary with every study, and when it comes to meeting the nutritional standard, behavior change was not guaranteed to occur or last.

Menozzi, Sogari, and Mora (2015) found that 81% of intention and 68% of behavior was impacted by their TPB intervention. However, in their discussion, they ask other researchers to exercise caution using this theory if behavior change is the desired outcome. Menozzi, Sogari, and Mora explain that past studies have also found that due to the habitual nature of behavior,

people struggle to carry out the good behaviors they intend to do. The researchers also recognized that consideration for socio-demographic and other variables needed to be included/extended into in the TPB intervention. This could mean that TPB alone might not be enough of a framework for an intervention if lasting behavior change was to occur. The researchers discussed that TPB is a good theory to explain and predict behavior, but, overall, it does not necessarily cause behavior change. Menozzi, Sogari, and Mora indicated that any future interventions using this theory may be more helpful to participants who are more willing to actually change their behavior from the start.

Kothe and Mullan (2015) found that behavior change can occur using TPB, but the behavior was not sustained one month after the intervention. This showed that if change occurred after a TPB intervention, it was not long lasting. A randomized control trial that Kothe and Mullan (2014) conducted showed that intention to consume more fruits and vegetables may have increased over time, but fruits and vegetable intake did not change throughout the intervention with TPB. The researcher found through their intervention that changes in TPB constructs most likely do not lead to behavior change.

Other factors and limitations could have also impacted the amount of participation in and the effectiveness of the intervention. First, the study group was a non-randomized, and no control group existed as a basis for comparison. Also, the students studied were all health studies or related majors and three students were nutrition minors. As previously stated, having a non-randomized group with potential background knowledge may impact the degree to which attitudes were influenced as students might have already been educated in what was supposed to be new knowledge. Fifteen of the 16 students (93%) were female, and the sample size was small,

which was not an accurate representation of the total BSU population. Having a population that resembled more closely the BSU demographics might have also brought about different results.

Also, timing of the lesson could have been a factor in poor participation, as the interventions took place at 8:00am on Thursday mornings during the winter in New England. Student attendance was lower when it snowed, which could have been due to transportation issues. Lack of willingness to participate and/or pay attention could have been due to not being able to travel in harsh, snowy weather, tiredness, or lack of time to engage in the intervention.

Using the intention-to-treat method (carrying over data from the pretest to fill in missing data in the posttest), showed no real difference in results. This method helped to avoid bias from data exclusion. Ranganathan, Pramesh, and Aggarwal (2016) indicate that an intention-to-treat method maintains sample size, eliminates bias, and yields results that more closely represents clinical practice. However, when carrying over missing data, the data from participants who completed all parts of the intervention become somewhat muted. Carrying over data assumes that the people who did not complete the intervention did not and would not change their behavior. This method factors the means of the initial scores into the posttest score—as if the people who failed to completely participate just completed the pretest again. This dampens the results of those who may have actually changed their intentions and behaviors, as 50% of the replicated data levels off the posttest results until they practically mirror the pretest.

After the intervention, participants reflected and concluded that they felt the intervention activities and methods were effective. Students found the visuals, interactive discussions, and scenarios to be helpful in their learning. Some students did not like the Family Feud game, as they did not remember the information from the prior lesson in order to answer the questions. A review—maybe in the form of a PowerPoint lecture or discussion—prior to the game would have

been beneficial in jogging their memory. A few students believed that some of the games used in the lesson would have worked better for a younger population, while other students enjoyed the games played and felt those methods helped them learn. Some students indicated that they struggled with maintaining their dietary logs due to their lifestyles, and other students believed that the log helped them make better food choices. The log results did not indicate that students overall increased their fruit and vegetable intake. Again, these reflections indicated a discrepancy between perception and actual behavior with TPB interventions, as participants may have enjoyed the lessons, intended to change behavior due to what they learned, but did not actually carry out the behavior.

Despite the limitations of the study, it did have one major strength. The circumstance of this study mimicked real life. The group of students analyzed were not perfect subjects, and the intervention did not happen in a completely controlled setting. This study showed how a TPB intervention would be a challenge when working with college students who have real, everyday issues that interfere with proper diet.

CONCLUSION

Overall the intervention did not yield statistically significant results, due to many factors. However, this investigation did support the idea that college students do not typically consume the recommended amount of fruits and vegetables on a regular basis. This intervention indicated that intention did not influence behavior change. Further investigation needs to be done to see if TPB can have any impact on college students' desire to change their fruit and vegetable consumption. Hackman and Knowlden's (2014) systematic review of TPB fruit and vegetable/nutritional interventions saw some degree of behavior change or increased intention in most studies. Many of these studies used pre-existing instruments like the Food Frequency Questionnaire or more frequent educational lessons (i.e. more than 2 classes over time to disseminate information). Future research could add more lessons and could survey students with a pre-existing method. Or, a future intervention could possibly take a qualitative approach. Researchers could conduct a focus group to understand a greater variety of the factors that impact college student's intake of fruits and vegetables.

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Appendix I: Pretest

BSU Student Fruits and Veggies Survey

Survey Directions

Please answer honestly and to the best of your ability, as this will yield more accurate results. Please do not look up any answers and do not leave any questions blank. Only give one response per question. The first few questions are for demographic statistical purposes and will not be used for discriminatory purposes. If you have questions or need clarification on any questions, feel free to ask Dr. Angela Bailey or Danielle Clark for clarity. Thank you!

1. What is your current age?

- a) Under 18 years old
- b) 18 years old
- c) 19 years old
- d) 20 years old
- e) 21 years old
- f) 22 years old
- g) 23 years old
- h) 24 years old or over

2. What is your current year in college?

- a) 1st year
- b) 2nd year
- c) 3rd year
- d) 4th year
- e) 5th year or more

3. What is your sex?

- a) Female
- b) Male
- c) I prefer not to answer

4. What is your gender?

- a) Female
- b) Male
- c) Transgender
- d) Other (please specify) _____

5. What race best describes you?

- a) White or Caucasian

- b) Black or African American
- c) Hispanic or Latino
- d) Asian or Asian American
- e) American Indian or Alaska Native
- f) Native Hawaiian or other Pacific Islander
- g) Another race (please specify)_____

6. Do you have any food allergies or dietary restrictions? If so, please share and briefly list any food alternatives.

7. Based on what you know, what is the recommended amount of fruits and vegetables a person your age and gender should consume?

- a) 1 cup each of fruits and vegetables per day
- b) 2 cups each of fruits and vegetables per day
- c) about 2-2.5 cups each of fruits and vegetables per day
- d) about 4-4.5 cups each of fruits and vegetables per day
- e) about 15 servings of fruits and vegetables per week
- f) No servings at all

**For this question and other rating scale questions, 1 means strongly disagree, 2 means disagree, 3 means somewhat disagree, 4 means somewhat agree, 5 means agree, and 6 means strongly agree.*

8. My consumption of the recommended amount fruits and vegetables makes me healthier than consuming none.

- 1 - Strongly Disagree
- 2 - Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree 5 - Agree
- 6 - Strongly Agree

9. Most people who eat the recommended fruit and vegetable amount are healthy

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

**Select your answer on the scale from very unpleasant to very pleasant.*

10. To me, consuming fruits and vegetables is...

- 1 - Very Unpleasant
- 2 – Unpleasant
- 3 - Somewhat Unpleasant
- 4 - Somewhat Pleasant
- 5 – Pleasant
- 6 - Very pleasant/Good

**Select your answer on the scale from very bad to very good.*

11. To me, consuming fruits and vegetables is...

- 1 - Very Bad
- 2 - Bad
- 3 - Somewhat Bad
- 4 - Somewhat Good
- 5 – Good
- 6 - Very Good

12. Most people/students like me consume the recommended amount of fruits and vegetables per day.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

13. I am confident that I can consume the recommended daily amount of fruits and vegetable daily.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

14. I intend to consume the recommended amount of fruits and vegetables daily.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree

- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

15. In the past week I have consumed the recommended amount of fruit and vegetables daily.

- a) Yes
- b) No

16. It is my choice to eat fruits and vegetables.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

17. In the near future, I will to incorporate consuming the recommended amount of fruits and vegetables and exercise into my lifestyle.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6- Strongly Agree

18. Most people who do not consume fruits and vegetables are unhealthy.

- 1.) Strongly Disagree
- 2.) Disagree
- 3.) Somewhat Disagree
- 4.) Somewhat Agree
- 5.) Agree
- 6.) Strongly Agree

19. I feel that I have enough resources on campus or at home to consume the standard amount of FV each day.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree

6 - Strongly Agree

Appendix II: Posttest

BSU Student Fruits and Veggies Survey

Survey Directions

Please answer honestly and to the best of your ability, as this will yield more accurate results. Please do not look up any answers and do not leave any questions blank. Only give one response per question. The first few questions are for demographic statistical purposes and will not be used for discriminatory purposes. If you have questions or need clarification on any questions, feel free to ask Dr. Angela Bailey or Danielle Clark for clarity. Thank you!

1. What is your current age?

- i) Under 18 years old
- j) 18 years old
- k) 19 years old
- l) 20 years old
- m) 21 years old
- n) 22 years old
- o) 23 years old
- p) 24 years old or over

2. What is your current year in college?

- f) 1st year
- g) 2nd year
- h) 3rd year
- i) 4th year
- j) 5th year or more

3. What is your sex?

- d) Female
- e) Male
- f) I prefer not to answer

4. What is your gender?

- e) Female
- f) Male
- g) Transgender
- h) Other (please specify) _____

5. What race best describes you?

- h) White or Caucasian
- i) Black or African American

- j) Hispanic or Latino
- k) Asian or Asian American
- l) American Indian or Alaska Native
- m) Native Hawaiian or other Pacific Islander
- n) Another race (please specify) _____

6. Do you have any food allergies or dietary restrictions? If so, please share and briefly list any food alternatives.

7. Based on what you know, what is the recommended amount of fruits and vegetables a person your age and gender should consume?

- g) 1 cup each of fruits and vegetables per day
- h) 2 cups each of fruits and vegetables per day
- i) about 2-2.5 cups each of fruits and vegetables per day
- j) about 4-4.5 cups each of fruits and vegetables per day
- k) about 15 servings of fruits and vegetables per week
- l) No servings at all

**For this question and other rating scale questions, 1 means strongly disagree, 2 means disagree, 3 means somewhat disagree, 4 means somewhat agree, 5 means agree, and 6 means strongly agree.*

8. My consumption of the recommended amount fruits and vegetables makes me healthier than consuming none.

- 1 - Strongly Disagree
- 2 - Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree 5 - Agree
- 6 - Strongly Agree

9. Most people who eat the recommended fruit and vegetable amount are healthy

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

**Select your answer on the scale from very unpleasant to very pleasant.*

10. To me, consuming fruits and vegetables is...

- 1 - Very Unpleasant
- 2 – Unpleasant
- 3 - Somewhat Unpleasant
- 4 - Somewhat Pleasant
- 5 – Pleasant
- 6 - Very pleasant/Good

**Select your answer on the scale from very bad to very good.*

11. To me, consuming fruits and vegetables is...

- 1 - Very Bad
- 2 - Bad
- 3 - Somewhat Bad
- 4 - Somewhat Good
- 5 – Good
- 6 - Very Good

12. Most people/students like me consume the recommended amount of fruits and vegetables per day.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

13. I am confident that I can consume the recommended daily amount of fruits and vegetable daily.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

14. I intend to consume the recommended amount of fruits and vegetables daily.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree

- 5 – Agree
- 6 - Strongly Agree

15. In the past week I have consumed the recommended amount of fruit and vegetables daily.

- c) Yes
- d) No

16. It is my choice to eat fruits and vegetables.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

17. In the near future, I will to incorporate consuming the recommended amount of fruits and vegetables and exercise into my lifestyle.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6- Strongly Agree

18. Most people who do not consume fruits and vegetables are unhealthy.

- 1.) Strongly Disagree
- 2.) Disagree
- 3.) Somewhat Disagree
- 4.) Somewhat Agree
- 5.) Agree
- 6.) Strongly Agree

19. I feel that I have enough resources on campus or at home to consume the standard amount of FV each day.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

20. I feel that this program (lesson plans and dietary record) helped me learn more about fruit and vegetable consumption.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

21. I feel that this program (lesson plans and dietary record) encouraged me to eat more fruits and vegetables.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

22. I feel that this program (lesson plans and dietary record) helped me make steps towards improving my diet.

- 1 - Strongly Disagree
- 2 – Disagree
- 3 - Somewhat Disagree
- 4 - Somewhat Agree
- 5 – Agree
- 6 - Strongly Agree

Appendix III: Lesson 1

Name: Danielle Clark
Grade Level: College
Date: TBD
Topic: TPB FV Consumption
Lesson Title: Fruits and Vegetables: What do you know about them?
Theory: Theory of Planned Behavior
Age of Target Population: 18+
Demographics: Approximately 25-20 males and female college students
NHES: “7.12.1 Analyze the role of individual responsibility for enhancing health” (Centers for Disease Control and Prevention, 2018).
 “7.12.2 Demonstrate a variety of healthy practices and behaviors that will maintain or improve the health of self and others” (Centers for Disease Control and Prevention, 2018).
 “7.12.3 Demonstrate a variety of behaviors to avoid or reduce health risks to self and others” (Centers for Disease Control and Prevention, 2018).

Objectives

Cognitive: While answering Kahoot questions catered to social norm, perceived behavioral control, and intention, BSU students will identify if their dietary patterns are influenced by perceived behavioral control, social norms, and intentions.

Affective: After reading the realistic diet scenarios, BSU students will write and verbally share two changes they would make to improve the scenario diet.

Psychomotor: Following the visual and verbal explanation of FV standards, BSU students will place FV on their plate to indicate the FV portions necessary to meet USDA standards for 2,000 calorie diet.

Introduction: Today we'll be learning about the USDA dietary standards for fruit and vegetable consumption and evaluating how to utilize those standards in every day life.

Developmental Section:

Content Outline	Method/Strategy	Estimated Time Needed	Materials Needed
I. KAHOOT A. Questions about Subjective Norm B. Questions about FV standards/Health Outcomes C. Questions about Benefits of FV	KAHOOT Question Game	15 Minutes	Kahoot, Cell Phone/Computer, Projector, Internet access
II. FV Standards A. My Plate Visuals B. Food	Visuals and Explanation	20 minutes	Fake or real food, Computer/poster, plates, cups, measuring cup,

B. Food Examples			handouts/takeaways
<p>III. Check Yourself Before you Wreck Yourself</p> <p>A. Realistic Scenarios about poor diet and outcomes</p> <p>B. Students can discuss how and if they would improve the scenario they are given</p>	<p>Problem solving based on what the students believe they can do</p>	<p>15 minutes</p>	<p>Mini White Boards, Dry Erase markers</p>
<p>Summary of Discussion Questions:</p> <ul style="list-style-type: none"> • Why is FV intake important when it comes to health outcomes? • Why do we need so many servings of FV per day? • What can you do to improve your diet? <p>Conclusion/Culmination: The activities for this lesson plan will help students gain knowledge of nutritional standards, learn diet-related health outcomes, help them assess others' diets, and identify changes for diets for diet improvement. Next meeting will reinforce these ideas and help students assess their own diets.</p> <p>Anticipated Problems/Possible Solutions: Students not wanting to participate due to feelings of embarrassment, shyness, indifference</p> <p>Evaluation: The evaluation of these activities will be the post-test, the discussion questions, and the dietary recall.</p>			

Appendix IV: Lesson 2

Name: Danielle Clark
Grade Level: College
Date: TBD
Topic: TPB FV Consumption
Lesson Title: Fruits and Vegetables: Time to Take Action!
Theory: Theory of Planned Behavior
Age of Target Population: 18+
Demographics: Approximately 25-20 males and female college students
NHES: “7.12.1 Analyze the role of individual responsibility for enhancing health” (Centers for Disease Control and Prevention, 2018).
 “7.12.2 Demonstrate a variety of healthy practices and behaviors that will maintain or improve the health of self and others” (Centers for Disease Control and Prevention, 2018).
 “7.12.3 Demonstrate a variety of behaviors to avoid or reduce health risks to self and others” (Centers for Disease Control and Prevention, 2018).

Objectives

Cognitive: While playing family feud, students will be able to identify the USDA fruits and vegetable standards and at least one health outcome related to poor nutrition.

Affective: After building plans, students will be able to verbally share at least one thing they plan to change in their diet.

Psychomotor: After assessing their own current diets, students will be able to write down at least one thing/action they want to change in their diets to improve them.

Introduction: Last week we learned about standards and ways to aim for them. This week we’ll be working on ways to better help ourselves achieve more fruit and vegetable intake.

Developmental Section:

Content Outline	Method/Strategy	Estimated Time Needed	Materials Needed
I. Family Feud Style Review A. FV Standards B. Benefits C. Outcomes of no/poor FV consumption	Family Feud	30 Minutes	Projector, Whiteboards & Markers or pen & paper
II. Assess and Plan A. What do I need to change? B. Guided Meal Plan/M meal Goals (To Do List)	Interactive Meal Planning	20 Minutes	Planner paper (give out mini planners), pencils or pens
III. Post Lesson	Explanation	5 minutes	Projector and

Dietary Recall Explanation			dietary recall sheets/books	
<p>Summary of Discussion Questions:</p> <ul style="list-style-type: none"> • Why is FV intake important • What do you need to change? • What will you do to implement the changes from the prior lesson? <p>Conclusion/Culmination: The activities for this lesson plan will help students retain knowledge of nutritional standards, help them assess their diets, and create goals for diet improvement. Next meeting is to follow up with the second. 3-day dietary recall.</p> <p>Anticipated Problems/Possible Solutions: Students not wanting to participate due to feelings of embarrassment, shyness, indifference</p> <p>Evaluation: The evaluation of these activities will be the post-test, the discussion questions, and the dietary recall.</p>				

Supplemental Material to Support the Developmental Section

I. Family Feud

Method/Strategy (Game/Q&A, Discussion)

Discussion Question: Why is FV intake important?

1. Display options on projector board
2. Round One Question: Name ways to incorporate fruits and vegetables into your diet?
 - a. Hidden Answers:
 - i. Pair them with other healthy options
 - ii. Add them to snacks and meals
 - iii. Stir Fry/mix into foods
 - iv. Lightly season them
 - v. 100% Fruit and Vegetable Juices
3. Round Two Question: What are the USDA standards for fruit and vegetable intake? What are they based off of
 - a. Hidden Answers:
 - i. 2-2.5 cups each or 5+ cups total of fruits and vegetables
 - ii. Half a plate (MyPlate)
 - iii. Generally Based off 2,000 cal diet.
 - iv. Actually based off of height, weight, gender/sex, age etc.
4. Round Three Question: What are some health outcomes of not eating enough fruits and vegetables?
 - a. Hidden Answers:
 - i. Obesity

- ii. Cardiovascular disease
- iii. Malnutrition
- iv. Diabetes Type II

Evaluation Discussion Questions:

1. What does a balanced plate look like?

I. Assess and Plan

Method/Strategy (Interactive Planning)

Discussion Question: What do you need to change?

1. Hand out planner paper to each person and make sure they have a writing utensil.
2. Have Students number their paper at least to 4.
3. Give students at least 5 minutes to write down things they would like to change (goals) to improve their fruit and vegetable intake and diets overall.
4. Have students share one or two things they plan on working on

Evaluation Discussion Questions:

2. Do you intend to make these changes and stick with them?
3. Do you believe you have the power/capability to make these changes?
4. Will you hold yourself accountable to making these changes?

I. Post Lesson Dietary Recall Explanation

Method/Strategy (Discussion)

Discussion Question: What will you do to implement the changes from the prior lesson?

1. Pass out logs or sheets different than the first dietary recall.
2. Instruct students to fill out all they eat and drink for breakfast, lunch, dinner, and snack for 3 days.

Evaluation Discussion Questions:

1. How many servings of fruits and vegetables do you intend to eat?

Evaluation:

Objective	Technique of Assessment
While playing family feud, students will be able to identify the USDA fruits and vegetable standards and at least one health outcome related to poor nutrition.	Students will guess answers for Fruit and Vegetable Family Feud.
After building plans, students will be able to verbally share at least one thing they plan to change in their diet.	Instructor will go around the room and allow students to verbally say at least one change they listed.
After assessing their own current diets,	Students will take time to write down a list

students will be able to write down at least one thing/action they want to change in their diets to improve them.	of their changes and goals.
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Appendix V: Dietary Record

3-Day Food Intake Record

Please keep a record of *everything* you **EAT** and **DRINK** for **3 days** – 2 weekdays and 1 weekend day. Include all meals, snacks, and beverages, and the time of day you are eating or drinking. **Please pick days that are TYPICAL for your current eating patterns.**

Please also record the supplements (i.e. vitamins, minerals, protein powders, sport supplements, shakes, etc.) in detail, including: the **name or supplement**, the **amount** you take, **how often** you take it, **when you started** the supplement, and **your reason for taking it**.

The purpose of filling out these food records is to help better understand **WHAT** you are eating, **WHEN** you are eating, and **HOW MUCH** you are eating. Please be as honest and accurate as you can, as the information you provide will help you better reflect on your eating habits.

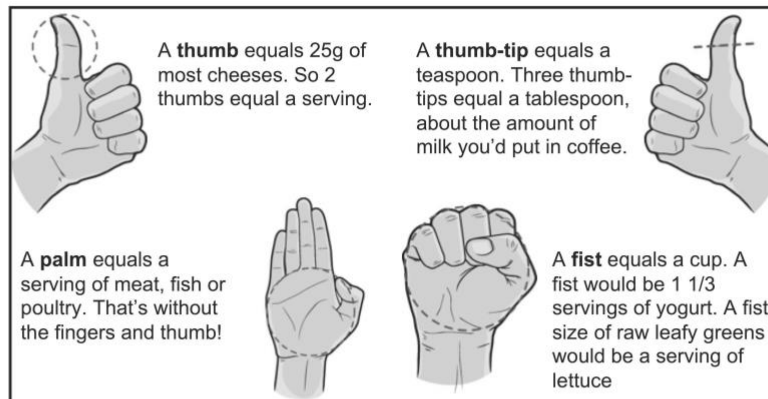
FOOD/BEVERAGE RECORDING INSTRUCTIONS:**1. Record all food and beverages consumed during a 24 hour period. Provide the following:**

- **Type of Food Eaten:** e.g. chicken noodle soup
- **Brand Name:** e.g. Campbell's, Lipton, Weight Watchers
- **Food or Beverage Characteristics:**
 - **Colour:** e.g. green vs. yellow beans; white vs. whole wheat bread
 - **Fat Content:** % fat (e.g. skim, 1%, 2% or homo milk), leanness of meat (e.g. extra lean ground beef), fat claims (e.g. "light", "low-fat"), was skin removed from poultry?
 - **Freshness:** e.g. fresh, frozen, canned, or dried?
 - **Other Details:** e.g. 25% reduced sodium, "diet" products, etc.
- **Time of Day** you ate or drank

2. Please MEASURE and describe the amount of food eaten as best as possible. Diet records are only reliable with accurate measurements.

- **Always estimate portion sizes of food after cooking.**
- **Use household measures to specify serving sizes.**
 - 1 cup = 250mL = 8 fluid oz 1 tablespoon (Tbsp) = 15mL
 - 1 ounce (oz) = 30g 1 teaspoon (tsp) = 5mL
- **Measuring cups (examples):** Put cooked pasta or rice into a measuring cup to record the correct amount before placing it on your plate. Measure your cereal out before pouring into a bowl, and don't forget to measure your milk as well!
- **Teaspoons/tablespoons (examples):** Measure out butter, margarine, mayonnaise, salad dressings, ketchup, mustard, ground flaxseed, sugar, milk/cream, and other condiments, seasonings, and toppings before adding to your food or beverages.
- **Count the number of food items if practical:** e.g.: 20 grapes, 15 baby carrots, 8 medium-sized shrimp, etc.
- **Fluids:** Record amounts in fluid ounces (oz), milliliters (mL), or in cups. Remember 1 cup = 250mL = 8 fl. oz

- **Use food labels to estimate quantities:** Food labels can help you estimate the quantity of food eaten based on weight or volume. For example, write down a 355mL can of pop, 1/2 of a 60g can of tuna, a 37g granola bar, etc.
- **Use your hand to estimate portion sizes quickly:**
 Whole Thumb = 1 Tablespoon Tip of your Thumb = 1 Teaspoon
 Palm of Your Hand = 3 oz of meat Fist = 1 cup (250mL)



3. **Record if anything was ADDED when preparing the food**, such as oil (list specific kind), sauce, butter, margarine, or other condiments or seasonings.
4. **For COMBINATION DISHES such as lasagna, casseroles, chili, soups, or stews include a description of the main ingredients.** E.g. Lasagna: lean ground beef (1/4 cup per piece), mozzarella cheese (1 oz per piece), cottage cheese (1 oz per piece), 1/2 cup tomato sauce, 2 noodles, 1/4 cup spinach.
5. **Include SNACK FOODS eaten.** Don't forget to include candy, chips, cookies, popcorn, ice cream, and beverages such as soft drinks, juice, coffee, or tea.
6. **Use the "notes" column to record any additional PRODUCT INFORMATION** if available (e.g. 6 crackers – 80 calories, 2.5g fat, 1g fibre, 210mg sodium).
7. **Don't forget to write down any ALCOHOLIC BEVERAGES consumed and how much you drank.** This includes all wine, beer, and liquor.

When in doubt... include more details!

Baseline Question: Are you taking any **supplements**? This includes all over-the-counter and prescribed supplements (e.g. multivitamin, iron, fish oil, etc.). ☐ Yes ☐ No

If yes, please list all supplements in the table below.

All Follow-Up Visits: Have you had any changes to your supplements since your last visit? ☐ Yes ☐ No
If **yes**, please indicate in the table below which supplements you have started or stopped taking, or if the dose or frequency has changed for any current supplements.

[illegible]

Sample 1-Day Food Record

Below is an *EXAMPLE* of how to keep accurate records. Include a detailed description and amounts for each item. Remember to record **water**, notes on **product details**, and the **times of day** you ate.

TIME	AMOUNT	DESCRIPTION	NOTES
8am	Large	Coffee	Tim Horton's
	1 Tbsp	Cream	
	2 tsp	Sugar	
11am	2 slices	Bread, whole wheat	
	2 oz.	Turkey, lunchmeat	Oven-roasted from deli
	1 Tbsp	Mayo (Hellman's)	"light", 4.5g fat per Tbsp
	1 leaf	Romaine Lettuce	
	1 tsp	Becel Margarine	Salt-free
11:30pm	2 cups	Water, tap	
2pm	1 medium	Apple (granny smith)	
	6	Whole wheat crackers (Premium Plus)	80 cal, 2.5g fat, 210mg sodium (from label)
	1"x1" cube	Marble cheese, 35%MF	Crackerbarrel
4pm	1 large	Muffin, blueberry	Store-bought
	500mL	Water, tap	
7:30pm	1 patty	Hamburger, BBQ'd (regular ground beef)	M&M Meat Shops (~4oz.)
	1	Hamburger Bun, white bread	
	1 leaf	Iceburg Lettuce	
	2 slices	Tomato, raw	
	1 slice	Red Onion, raw	
	2 Tbsp	Ketchup, Heinz	45 calories per tsp
	1 bottle	Beer (12 oz, 5% alcohol)	Moosehead
10pm	2 cups	Chocolate ice cream	Chapman's

Was this a typical day? If not, why? Usually drink more water (forgot water bottle at home)

Did you take all of your usual medications and supplements as prescribed? ☒ Yes ☐ No

Subject Code: _____ Date: _____ ☐ Weekday or ☐ Weekend

Please list all food/beverages/water/medications/supplements. Estimate all food/drink amounts accurately.

[illegible]

Was this a typical day? If not, why? _____

Did you take all of your usual medications and supplements as prescribed? ☐ Yes ☐ No

Subject Code: _____ Date: _____ ☐ Weekday or ☐ Weekend

Please list all food/beverages/water/medications/supplements. Estimate all food/drink amounts accurately.

[illegible]

Was this a typical day? If not, why? _____

Did you take all of your usual medications and supplements as prescribed? ☐ Yes ☐ No

Subject Code: _____ Date: _____ ☐ Weekday or ☐ Weekend

Please list all food/beverages/water/medications/supplements. Estimate all food/drink amounts accurately.

[illegible]

Was this a typical day? If not, why? _____

Did you take all of your usual medications and supplements as prescribed? ☐ Yes ☐ No

Appendix VI: IRB Form

Office Use Only					
Date Reviewed:				IRB Case No:	
Action:					
<input type="checkbox"/> Approved	<input type="checkbox"/> Exempt	<input type="checkbox"/> Expedited	<input type="checkbox"/> Full	<input type="checkbox"/> Not Approved	IRB Reviewer:

Bridgewater State University
INSTITUTIONAL REVIEW BOARD (IRB)

APPLICATION FOR THE CONDUCT OF RESEARCH INVOLVING HUMAN SUBJECTS

The IRB reviews all requests to conduct research involving human subjects.

It is the Investigator's responsibility to give complete information regarding procedures and the informed consent process. A complete explanation of the requirements can be found in the Bridgewater State University Policy on the Use of Human Subjects in Research.

After completing the application and obtaining required signatures, one original of the application and all supporting materials must be forwarded to the IRB Executive Secretary, Office of Grants and Sponsored Projects, Maxwell Library, Room 200. The IRB Executive Secretary will notify each applicant of the IRB's decision. If you have questions about the application process, please contact the IRB Executive Secretary at (508) 531-1242.

Project Title	Impact of a Brief Theory of Planned Behavior Based Intervention to Increase Fruit and Vegetable Intake in College Students
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1a. Primary Investigator Name (corresponding investigator, unless otherwise requested)

First Name	Angela	Last Name	Bailey
Department	MAHPLS		
Address	131 Summer Street	(If off-campus, include city, state and zip code)	
Email Address	a4bailey@bridgew.edu	Phone Number	508-531-1828

1b. Co-investigator(s)

First Name	Danielle	Last Name	Clark
Department	MAHPLS		
Address	131 Summer Street	(If off-campus, include city, state and zip code)	
Email Address	d2clark@student.bridgew.edu	Phone Number	781-588-2508

First Name		Last Name	
Department			
Address		(If off-campus, include city, state and zip code)	
Email Address		Phone Number	

First Name		Last Name	
Department			
Address		(If off-campus, include city, state and zip code)	
Email Address		Phone Number	

Is this a continuation of an approved IRB project?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, provide previous IRB case number:		
Is this a class project?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Is this a thesis?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

2. Study Timeline

a. Anticipated starting date:
Study, including recruitment, cannot begin prior to IRB approval.

February 11, 2018

b. Duration of Study in months: (maximum approval period is 12 months)
Periodic Review/Renewal required after approved period.

3 months

3. Funding Status

Is the researcher receiving support
or applying for funding?

☒ Yes☐ No

If YES, you must submit one complete copy of the proposal with this application.

List Source

Undergraduate Research Grant

Describe any consulting or other
relationships with this sponsor.

Funding will be used for:

☒ Paying Participants (Provide further details in compensation section)

☒ Researcher Expenses (Postage, Equipment, Travel, etc.)

☐ Other :

Please
describe:

4. Recruitment/Selection of Subjects

a. Maximum number of participants to be enrolled.

20

If screening will occur, report number that will be screened.

20

b. Characteristics of subjects (check as many boxes as appropriate).

<input type="checkbox"/> Minors	<input type="checkbox"/> Disabled (Physically or Mentally)	<input type="checkbox"/> Elementary School Students
<input checked="" type="checkbox"/> Adults	<input type="checkbox"/> Legally Incompetent	<input type="checkbox"/> Middle School Students
<input type="checkbox"/> Prisoners	<input type="checkbox"/> Cognitively Impaired	<input type="checkbox"/> High School Student
<input type="checkbox"/> Pregnant	<input type="checkbox"/> Non-English Speaking	<input checked="" type="checkbox"/> BSU Students

c. Briefly describe the criteria for selection of subjects (inclusion/exclusion). Include such information as age range, health status, etc. Attach copies of all recruitment tools (advertisements, posters, etc.).

Subjects who are enrolled in Dr. Angela Bailey's HEAL450 class will be invited to participate in the study. Exclusions will be made if participants have a preexisting medical condition that limits dietary intake (ie, celiac disease), a condition that limits dietary intake during data collection (ie, flu) or unreliable data (ie, did not complete data collection or attend intervention classes).

d. Please describe how you will identify and recruit prospective participants.

Danielle will attend one of Dr. Bailey's HEAL451 classes prior to the pretest and briefly explain all parts of the program. She will then invite the students by word-of-mouth to participate. An attendance list will identify who chooses to participate in all parts.

e. Records

Are you accessing private records? (i.e. medical, educational, employment)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
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If YES, describe process for obtaining approval for the use of the records or for securing consent from the subjects. Attach a letter of support from the holder or custodian of the records i.e. primary physician, therapist, public school official.).

f. Please describe your relationship to the potential participants (i.e. instructor of class, co-worker, etc.). If no relationship, state no relationship.

No relationship

5. Performance Sites/Location of Research

- ☒ Bridgewater State University Facility
☐ Public Location
☐ Other

Please describe and provide letters of cooperation and/or support.

6. Project Abstract

a. Provide a brief summary of the project, using non-technical terms that would be understood by a non-scientific reader. Please limit this description to no more than one page, and provide details in the method section.

College students globally, nationally, and at BSU typically do not consume the daily-recommended servings of fruit and vegetables. To address this issue, the Theory of Planned Behavior (TPB) was used to design two lesson plans aimed to increase fruit and vegetable intake in college students. Two TPB-based lessons will be delivered to a sample of BSU college students in the spring of 2019. A pretest and posttest survey will be used to evaluate the impact of the intervention on the TPB constructs. Student's dietary records will be analyzed to evaluate changes in fruit and vegetable intake. The findings of the study will contribute to existing TPB dietary interventions. Additionally, the findings will inform future educational programming offered to BSU students designed to increase fruit and vegetable intake.

b. Describe the scientific objectives (aims) of this research, including (brief) discussion of previous relevant research.

A wellness survey of BSU students conducted in the fall of 2018 indicated the average intake of fruit and vegetables was 3.3 cups compared to the recommended 4.5+ cups/day. The aim of this research is two-fold: 1. to assess the current intake of fruit and vegetables in a sample of college students and 2. to evaluate the effectiveness of participation in a TPB intervention in impacting the constructs of the TPB (ie, attitude, social norm, and perceived behavioral control) as well as increasing fruit and vegetable consumption.

c. Method: Provide a sequential description of all procedures, researcher participant interaction, and intervention. Include the measures you plan to use, the time period(s) involved, and any deception that may be used.

The project will be implemented in Dr. Bailey's HEAL 450 class in the spring of 2019. Students will complete a pretest survey designed to measure demographic information, knowledge of current fruit/vegetable recommendations and the TPB constructs of attitude, social norm, perceived behavioral control and intention in February 2019. Additionally, students will also complete a 3-day dietary record prior to the intervention to establish a baseline of fruit and vegetable intake. In March 2019 students will participate in two (2) TPB-based lesson plans. Four weeks after the implementation of the first lesson, a posttest will be administered to evaluate the impact of the intervention on the TPB constructs and a second 3-day dietary record will be completed by participants to measure change in fruit and vegetable intake.

d. Personnel: Identify all personnel who will participate in the conduct of this research and outline their qualifications.

Dr. Angela Bailey, PhD in Human Nutrition, Foods and Exercise and current MAHPLS department assistant professor.
Danielle Clark, BSU Honor's Student majoring in Health Studies with a minor in nutrition.

e. Describe any potential risks or discomforts of participation and the steps that will be taken to minimize them.

Students taking the survey may feel discomfort or not want to answer questions about their perceptions about themselves or others. Students may not want to participate in activities, like ones that involve them sharing things they want to change about their diet, as they may feel self-conscious, shy, uncomfortable. Students may not want to complete the dietary recall as they may feel self-conscious or offended that they need to complete it. Students will be assured that their information will remain confidential and can choose not to share information during class discussions.

f. Describe the anticipated benefits to the individual participants. If none, state that. (Note that compensation is not a benefit, but should be listed in the compensation section on the next page.).

Participants will be given knowledge of fruit and vegetable intake recommendations, the benefits of eating a healthy diet and taught skills on how to improve their diets. They will also be able to assess strengths and weaknesses in their nutritional habits.

g. Describe the anticipated benefits to society and/or the scientific community in lay language. There must be some benefit to justify the use of human subjects.

The findings will inform future educational programming offered to BSU students designed to increase fruit and vegetable intake. Increasing fruit and vegetable intake and eating a healthy diet can reduce risk of chronic diseases and risk factors for chronic disease such as obesity.

7. Data Collection and Management (Check all that apply)

☒ a. Nature of data makes it potentially identifiable (e.g. video or audio recordings, photographs, IP address, material with DNA, etc.)

☒ b. Data will be recorded with identifying information (e.g. name, SSN, Banner ID, etc.)

Will data be de-identified?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
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If yes, please provide a timeframe and details (for example describe the destruction of identifying information or the process of assigning a code to replace identifiers)

Will there be a master list connecting the code?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
--	------------------------------	--

If you checked a or b, please provide details of how data will be stored securely (i.e. locked cabinet, password protected, etc.).

The data will be scored on a password protected laptop and the paper dietary records will be stored in a locked cabinet in Dr. Bailey's office.

If master code list is used, please provide detail, such as how/where code list is securely stored, when it will be destroyed, etc.

☐ c. Data will be recorded without possibility of identification (Check this box only if any identifying information will be destroyed or eliminated and cannot be restored)

☐ d. Data is collected anonymously (Check this box only if it is not possible to connect respondents to data. Do not check this box if data will be collected electronically.)

e. Data sharing

Will identifiable data be shared with anyone outside the immediate research team? (Check yes only if the respondents will be identified or identifiable in reports, presentations, etc.)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
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f. Recording (Note that recordings and photographs are identifiable, so data is not anonymous.)

Will participants be audio recorded?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Will participants be video recorded?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Will participants be photographed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

If YES, please describe how/where recordings will be stored, who will have access to them, and an estimate of the date (month/year) that they will be destroyed.

g. Additional Details (if needed).

8. Compensation

a. Will participants receive a gift or token of appreciation?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If YES, list the item and its approximate value. Stress ball, \$3 a piece		
b. Will participants receive services, treatment or supplies that have a monetary value?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If YES, please describe and provide the approximate value.		
c. Will participants receive course credit?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If YES, please describe non-research alternatives to earn the credit, the number of points awarded and what percentage of total points for the course it represents.		
d. Will participants receive monetary compensation (including gift cards)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If YES, please detail the amount per session and total compensation possible. Additionally, describe what compensation amount is paid to participants who discontinue participation prior to completion. *		

* If University funds are used to compensate participants, the name and address of participants will need to be provided to the Finance Office. If participants will be paid \$100 or more in a calendar year, participant social security numbers must be provided to Finance. The consent form must reflect this.

** If you plan to use university funds to compensate participants, IRB approval may not be sufficient. In all cases, University Trust Fund Guidelines apply, please contact Accounting Office with questions. In some cases BSU may require further paperwork or documentation from you and/or your participants.

9. Consent Process (Select One of the Following Options)

☒ I am obtaining signed consent for this study. Attach copies of all consent/assent documents, using the BSU templates as a guide to ensure all required elements are present.

☐ I am requesting a waiver or alteration of Informed Consent.

Provide details below and attach information that will be provided to participants regarding the study (email, opening page of online study, cover/consent letter, other consent text, etc.).

Additional information or rationale for request for waiver:

b. How and where will the consent process occur? Will participants have an opportunity to ask questions and have them answered? What will be done to avoid coercion or undue influence?

The informed consent will appear at the beginning of the pretest survey and participants will have the option of declining to participate. Additionally, Dr. Bailey and Danielle will be in the classroom while students are completing the survey and will be available to respond to questions or concerns.

c. Will the investigator(s) be obtaining all of the informed consents?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If NO, identify by name and training who will be describing the research to subjects/representatives and inviting their participation?		
d. Will any participants be minors?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If YES, include procedures/form for parental consent and for the assent from the minor.		

10a. Do you or any other persons involved in conducting this research have any potential conflicts of interest, (e.g., funding source, personal investments in a company that may profit from the research, source of product being tested) that may affect the rights and welfare of human subjects or may be perceived as affecting them?

☒ No Known Conflict Of Interest (continue to Section 11)

☐ Potential Conflict or Appearance of Conflict of Interest that does not need to be disclosed to participants (complete 10b through 10c)

☐ Potential Conflict or Appearance of Conflict of Interest that should be disclosed to participants (complete 10b through 10d)

10b. In the box below, describe potential conflict or appearance of conflict of interest

10c. In the box below, describe how you intend to manage potential conflict or appearance of conflict of interest

10d. In the box below, describe how participants will be informed of potential conflict or appearance of conflict of interest

11. Principal Investigator Certifications

- I understand that I have ultimate responsibility for thoroughly and accurately completing this application, the
- ☒ protection of the rights and welfare of human subjects, the conduct of the study and the ethical performance of the project.
 - ☒ I have included all instruments (questionnaires, surveys, tests recruitment tools, interview questions, etc.)
 - ☒ I have included recruitment materials (advertisements, postings, etc.), debriefing materials
 - ☒ I have included informed consent, parental consent/permission, and/or minor assent materials
 - ☐ I have included letters of assent or approval from any cooperating institutions
 - ☒ I have included all required signatures
- I certify that I am familiar with the ethical guidelines and regulations regarding the protection of human
- ☒ participants from research risks and the ethical principles of my profession and will adhere to the policies and procedures of the College of Bridgewater State University Institutional Review Board
 - ☒ I have completed the BSU IRB approved training within the last 3 years and the Certificate of Completion is attached
- I will ensure that all research staff working on the proposed project who will have direct and substantive
- ☒ involvement in proposing, performing, reviewing, or reporting this research (including students fulfilling these roles) complete IRB approved training
- ☒ I will send this form via an official workplace email address (e.g. @bridgew.edu, or @maritime.edu)
 - ☒ All investigators who have signed below have completed and approved this form

Investigator Assurance:

The principal investigator may not initiate any research involving human subjects until written notification of IRB approval or compliance with any and all contingencies made in connection with said approval has been received. Failure to provide all required information will result in return of your IRB application for correction prior to IRB review.

I understand that as Principal Investigator, I have ultimate responsibility for the protection of the rights and welfare of human subjects, conduct of the study and the ethical performance of the project.

I agree to comply with the letter and spirit of the Bridgewater State University policies on research and investigation involving human subjects, as well as with all applicable federal, state and local laws regarding the protection of human subjects in research, including, but not limited to the following:

- No changes will be made in the protocol or consent form until approved by the BSU IRB.
- Legally effective informed consent will be obtained from human subjects if applicable, and documentation of informed consent will be retained, in a secure environment, for three years after termination of the project.
- Adverse/unexpected events will be reported to the BSU IRB promptly.
- All protocols are approved for a maximum period of one year. Research must stop at the end of that approval period unless the protocol is re-approved for another term.

SIGNATURES: I certify to the best of my knowledge the information presented is an accurate reflection of the proposed research project and that I intend to comply with the letter and spirit of the Bridgewater State University Policy on the Protection of Human Subjects in Research.

Full Name of Principal Investigator:

Angela Bailey

Signature of Principal Investigator:

Date:

Full Name of Co-Investigator:

Danielle Clark

Signature of Co-Investigator:

Date:

Full Name of Co-Investigator:

Signature of Co-Investigator:

Date:

Full Name of Co-Investigator:

Signature of Co-Investigator:

Date: